

THE INVENTION CLAIMED IS:

1. A method of managing work in progress within a small lot size semiconductor device manufacturing facility comprising:

5 providing a small lot size semiconductor device manufacturing facility having:

a plurality of processing tools; and

10 a high speed transport system adapted to transport small lot size substrate carriers among the processing tools; and

maintaining a predetermined work in progress level within the small lot size semiconductor device manufacturing facility by:

15 increasing an average cycle time of low priority substrates within the small lot size semiconductor device manufacturing facility; and

20 decreasing an average cycle time of high priority substrates within the small lot size semiconductor device manufacturing facility so as to approximately maintain the predetermined work in progress level within the small lot size semiconductor device manufacturing facility.

25 2. The method of claim 1 wherein the small lot size is 5 or fewer substrates.

3. The method of claim 2 wherein the small lot size is 3 or fewer substrates.

30 4. The method of claim 1 wherein increasing an average cycle time of low priority substrates and decreasing an average cycle time of high priority substrates comprises prior, to processing, storing small lot size substrate carriers containing low priority substrates within the small lot size substrate carrier storage locations of one or more  
35 of the processing tools for a longer time period than small

lot size substrate carriers containing high priority substrates.

5           5.    A method of managing work in progress within a small lot size semiconductor device manufacturing facility comprising:

                  providing a small lot size semiconductor device manufacturing facility having:

                          a plurality of processing tools;  
10                       small lot size substrate carrier storage locations proximate each of the processing tools; and  
                          a high speed transport system adapted to transport small lot size substrate carriers among the processing tools;

15                       storing small lot size substrate carriers containing low priority substrates within the small lot size substrate carrier storage locations of one or more of the processing tools; and

                          processing high priority substrates  
20           available to the one or more of the processing tools ahead of the stored low priority substrates so as to reduce cycle time of high priority substrates without correspondingly reducing work in progress within the small lot size semiconductor device manufacturing facility.

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                  6.    The method of claim 5 wherein the small lot size is 5 or fewer substrates.

                  7.    The method of claim 6 wherein the small lot  
30           size is 3 or fewer substrates.

                  8.    A method of managing work in progress within a small lot size semiconductor device manufacturing facility comprising:

providing a small lot size semiconductor device manufacturing facility having:

a plurality of processing tools;  
small lot size substrate carrier storage  
5 locations proximate each of the processing tools; and  
a high speed transport system adapted to transport small lot size substrate carriers among the processing tools;

storing small lot size substrate carriers  
10 containing low priority substrates and small lot size substrate carriers containing high priority substrates within the small lot size substrate carrier storage locations of one or more of the processing tools; and  
prior to processing within the one or more of  
15 the processing tools, storing high priority substrates for a shorter time period on average than low priority substrates so as to reduce cycle time of high priority substrates without correspondingly reducing work in progress within the small lot size semiconductor device manufacturing facility.

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9. A method of managing work in progress within a small lot size semiconductor device manufacturing facility comprising:

providing a small lot size semiconductor  
25 device manufacturing facility having:  
a plurality of processing tools; and  
a high speed transport system adapted to transport small lot size substrate carriers among the processing tools; and

30 processing high and low priority substrates within the small lot size semiconductor device manufacturing facility with different cycle times while keeping average cycle time and work in progress at approximately the same level as average cycle time and work in progress of a large  
35 lot size semiconductor device manufacturing facility.

10. A method of managing work in progress within a small lot size semiconductor device manufacturing facility comprising:

5                   providing a small lot size semiconductor device manufacturing facility having:  
                    a plurality of processing tools; and  
                    a high speed transport system adapted to transport small lot size substrate carriers among the  
10   processing tools; and  
                    processing substrates within the small lot size semiconductor device manufacturing facility with a lower average cycle time than a large lot size semiconductor device manufacturing facility while maintaining  
15   approximately the same overall output as the large lot size semiconductor device manufacturing facility.

11. A method of managing work in progress within a small lot size semiconductor device manufacturing facility  
20   comprising:

                    providing a small lot size semiconductor device manufacturing facility having:  
                    a plurality of processing tools; and  
                    a high speed transport system adapted to  
25   transport small lot size substrate carriers among the processing tools; and  
                    processing substrates within the small lot size semiconductor device manufacturing facility with approximately the same average cycle time and work in  
30   progress as a large lot size semiconductor device manufacturing facility while increasing output of the small lot size semiconductor device manufacturing facility relative to the large lot size semiconductor device manufacturing facility.

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12. A method of managing work in progress within a small lot size semiconductor device manufacturing facility comprising:

- 5       providing a small lot size semiconductor device manufacturing facility having:
  - a plurality of processing tools; and
  - a high speed transport system adapted to transport small lot size substrate carriers among the processing tools; and
- 10       identifying work in progress that is not to be processed within a predetermined time period;
  - transferring the identified work in progress from small lot size substrate carriers to large lot size substrate carriers; and
- 15       storing the large lot size substrate carriers in volume storage.

13. The method of claim 12 wherein transferring the identified work in progress from small lot size substrate carriers to large lot size substrate carriers comprises employing a sorter to transfer the identified work in progress from the small lot size substrate carriers to the large lot size substrate carriers.

25       14. The method of claim 12 wherein storing the large lot size substrate carrier in volume storage comprises storing the large lot size substrate carriers at a location remote from the processing tools.

30       15. The method of claim 14 further comprising storing small lot size substrate carrier proximate one or more of the processing tools.

35       16. The method of claim 12 further comprising retrieving a large lot size substrate carrier from volume

storage and transferring substrates stored therein back into small lot size substrate carriers.

17. A small lot size semiconductor device
- 5 manufacturing facility having:
- a plurality of processing tools; and
  - a high speed transport system adapted to transport small lot size substrate carriers among the processing tools; and
- 10 at least one controller adapted to:
- maintain a predetermined work in progress level within the small lot size semiconductor device manufacturing facility by:
- increasing an average cycle time of
- 15 low priority substrates within the small lot size semiconductor device manufacturing facility; and
- decreasing an average cycle time of high priority substrates within the small lot size semiconductor device manufacturing facility so as to
- 20 approximately maintain the predetermined work in progress level within the small lot size semiconductor device manufacturing facility.

18. A small lot size semiconductor device
- 25 manufacturing facility having:
- a plurality of processing tools;
  - small lot size substrate carrier storage locations proximate each of the processing tools;
  - a high speed transport system adapted to
- 30 transport small lot size substrate carriers among the processing tools; and
- at least one controller adapted to:
- store small lot size substrate carriers containing low priority substrates within the small lot size

substrate carrier storage locations of one or more of the processing tools; and

process high priority substrates available to the one or more of the processing tools ahead of the stored low priority substrates so as to reduce cycle time of high priority substrates without correspondingly reducing work in progress within the small lot size semiconductor device manufacturing facility.

10           19. A small lot size semiconductor device manufacturing facility having:  
              a plurality of processing tools;  
              small lot size substrate carrier storage locations proximate each of the processing tools;  
15           a high speed transport system adapted to transport small lot size substrate carriers among the processing tools; and  
              at least one controller adapted to:  
              store small lot size substrate carriers  
20 containing low priority substrates and small lot size substrate carriers containing high priority substrates within the small lot size substrate carrier storage locations of one or more of the processing tools; and  
              prior to processing within the one or  
25 more of the processing tools, store high priority substrates for a shorter time period on average than low priority substrates so as to reduce cycle time of high priority substrates without correspondingly reducing work in progress within the small lot size semiconductor device manufacturing  
30 facility.

          20. A small lot size semiconductor device manufacturing facility having:  
              a plurality of processing tools; and

a high speed transport system adapted to transport small lot size substrate carriers among the processing tools; and

at least one controller adapted to process  
5 high and low priority substrates within the small lot size semiconductor device manufacturing facility with different cycle times while keeping average cycle time and work in progress at approximately the same level as average cycle time and work in progress of a large lot size semiconductor  
10 device manufacturing facility.

21. A small lot size semiconductor device manufacturing facility having:

a plurality of processing tools; and  
15 a high speed transport system adapted to transport small lot size substrate carriers among the processing tools; and

at least one controller adapted to process substrates within the small lot size semiconductor device  
20 manufacturing facility with a lower average cycle time than a large lot size semiconductor device manufacturing facility while maintaining approximately the same overall output as the large lot size semiconductor device manufacturing facility.

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22. A small lot size semiconductor device manufacturing facility having:

a plurality of processing tools; and  
a high speed transport system adapted to  
30 transport small lot size substrate carriers among the processing tools; and

at least one controller adapted to process substrates within the small lot size semiconductor device manufacturing facility with approximately the same average  
35 cycle time and work in progress as a large lot size



semiconductor device manufacturing facility while increasing output of the small lot size semiconductor device manufacturing facility relative to the large lot size semiconductor device manufacturing facility.

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23. A small lot size semiconductor device manufacturing facility having:

a plurality of processing tools; and

a high speed transport system adapted to

10 transport small lot size substrate carriers among the processing tools; and

at least one controller adapted to:

identify work in progress that is not to be processed within a predetermined time period;

15 transfer the identified work in progress from small lot size substrate carriers to large lot size substrate carriers; and

store the large lot size substrate carriers in volume storage.